Small Business Innovation Research/Small Business Tech Transfer

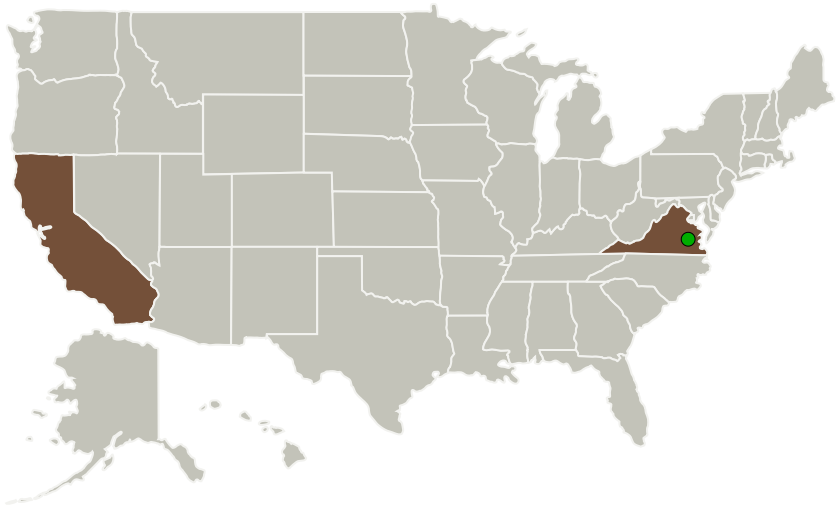
A Formal Approach to User Interface Design Using Hybrid System Theory, Phase II

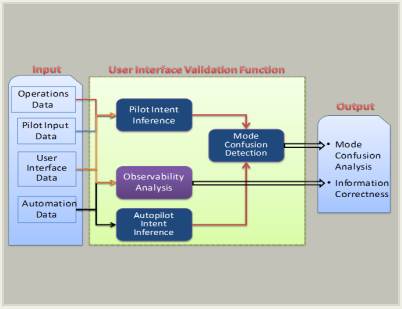
Completed Technology Project (2014 - 2016)

Project Introduction

Based upon the feasibility demonstrated in the Phase I research, Optimal Synthesis Inc.(OSI) proposes to develop a software tool that can be used validate aircraft flight deck user interfaces over the entire flight envelope. The approach is based on a mathematical formalism derived from hybrid systems theory. The correctness of information content in user interfaces is analyzed by a special observability test that takes into account of the limitations in human cognition and psychology. A possible mismatch between an operational mode perceived by the human operator and the one active in the aircraft is detected using an algorithm that compares the inferred intent of the human operator to that of the machine. Metrics-based performance evaluation will be carried out to demonstrate the benefits of the prototype software developed under the Phase II research. The feasibility of employing the software on the flight deck as a real-time pilot aid will also be analyzed in the Phase II research.

Primary U.S. Work Locations and Key Partners





A Formal Approach to User Interface Design Using Hybrid System Theory, Phase II

Table of Contents

Small Business Innovation Research/Small Business Tech Transfer

A Formal Approach to User Interface Design Using Hybrid System Theory, Phase II

Completed Technology Project (2014 - 2016)

Organizations Performing Work	Role	Type	Location
Optimal Synthesis, Inc.	Lead Organization	Industry Small Disadvantaged Business (SDB)	Los Altos, California
Langley Research Center(LaRC)	Supporting Organization	NASA Center	Hampton, Virginia

Primary U.S. Work Locations	
California	Virginia

Project Transitions

April 2014: Project Start

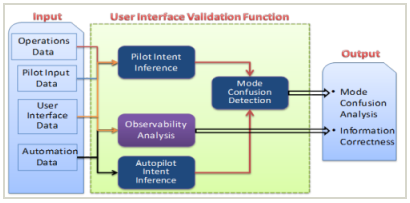
April 2016: Closed out

Closeout Summary: A Formal Approach to User Interface Design Using Hybrid System Theory, Phase II Project Image

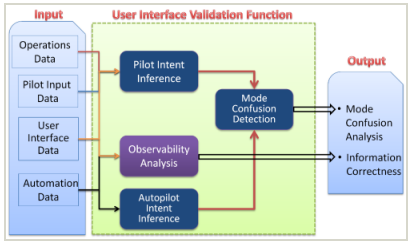
Closeout Documentation:

- Final Summary Chart Image*(https://techport.nasa.gov/file/137639)*

Images



Briefing Chart Image
A Formal Approach to User Interface Design Using Hybrid System Theory, Phase II *(https://techport.nasa.gov/image/135241)*



Final Summary Chart Image
A Formal Approach to User Interface Design Using Hybrid System Theory, Phase II Project Image *(https://techport.nasa.gov/image/132377)*

Organizational Responsibility

Responsible Mission Directorate:
Space Technology Mission Directorate (STMD)

Lead Organization:
Optimal Synthesis, Inc.

Responsible Program:
Small Business Innovation Research/Small Business Tech Transfer

Project Management

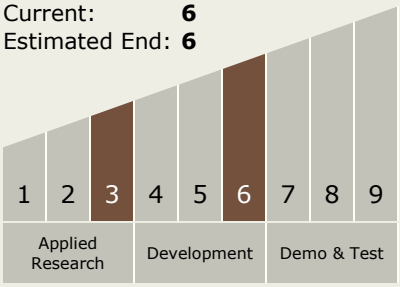
Program Director:
Jason L Kessler

Program Manager:
Carlos Torrez

Principal Investigator:
Bong-jun Yang

Technology Maturity (TRL)

Start: **3**
Current: **6**
Estimated End: **6**



A Formal Approach to User Interface Design Using Hybrid System Theory, Phase II

Completed Technology Project (2014 - 2016)

Technology Areas

Primary:

- TX01 Propulsion Systems
  - TX01.3 Aero Propulsion
    - TX01.3.9 Hybrid Electric Systems

Target Destinations

The Sun, Earth, The Moon, Mars, Others Inside the Solar System, Outside the Solar System